

EXECUTIVE SUMMARY

TEXAS STATE WATER PLAN

REGION B

JUNE 2005

**EXECUTIVE SUMMARY
TEXAS STATE SENATE BILL 1
REGION B**

Introduction

Senate Bill 1 of the 75th Texas Legislature was passed in 1997 to set the process of developing a comprehensive state water plan. To accomplish this task, the state was divided into 16 regional water planning groups. This report describes Region B as designated by Senate Bill 1. Region B is comprised of ten entire counties and a portion of one county in north central Texas. Specifically, those counties are Archer, Baylor, Clay, Cottle, Foard, Hardeman, King, Montague, Wichita, Wilbarger, and the City of Olney in Young County. Figure 1 shows the region, cities, towns, and the counties it encompasses.

Description of Region B

Region B lies mainly in the Red River Basin, however, southern portions of Archer and Clay Counties lie in the Trinity River Basin, and southern portions of Archer, Baylor, and King Counties lie in the Brazos River Basin.

In 2000, the total population of the region was reported to be 201,970, with the largest population center, the City of Wichita Falls, being 104,197 or 52 percent of the total. The second largest city was Vernon with a population of 11,660.

In general, most of the population is concentrated in eastern portions of the region with over one-half located in and around Wichita Falls. The January 1, 2000 estimated population density of the region ranged from a high of 210 persons per square mile (Wichita County) to a low of less than one person per square mile (King County). Regional population is forecasted to increase by approximately ten percent over the study period. Table ES-1 shows the 1990 census population by county and the corresponding census population in 2000.

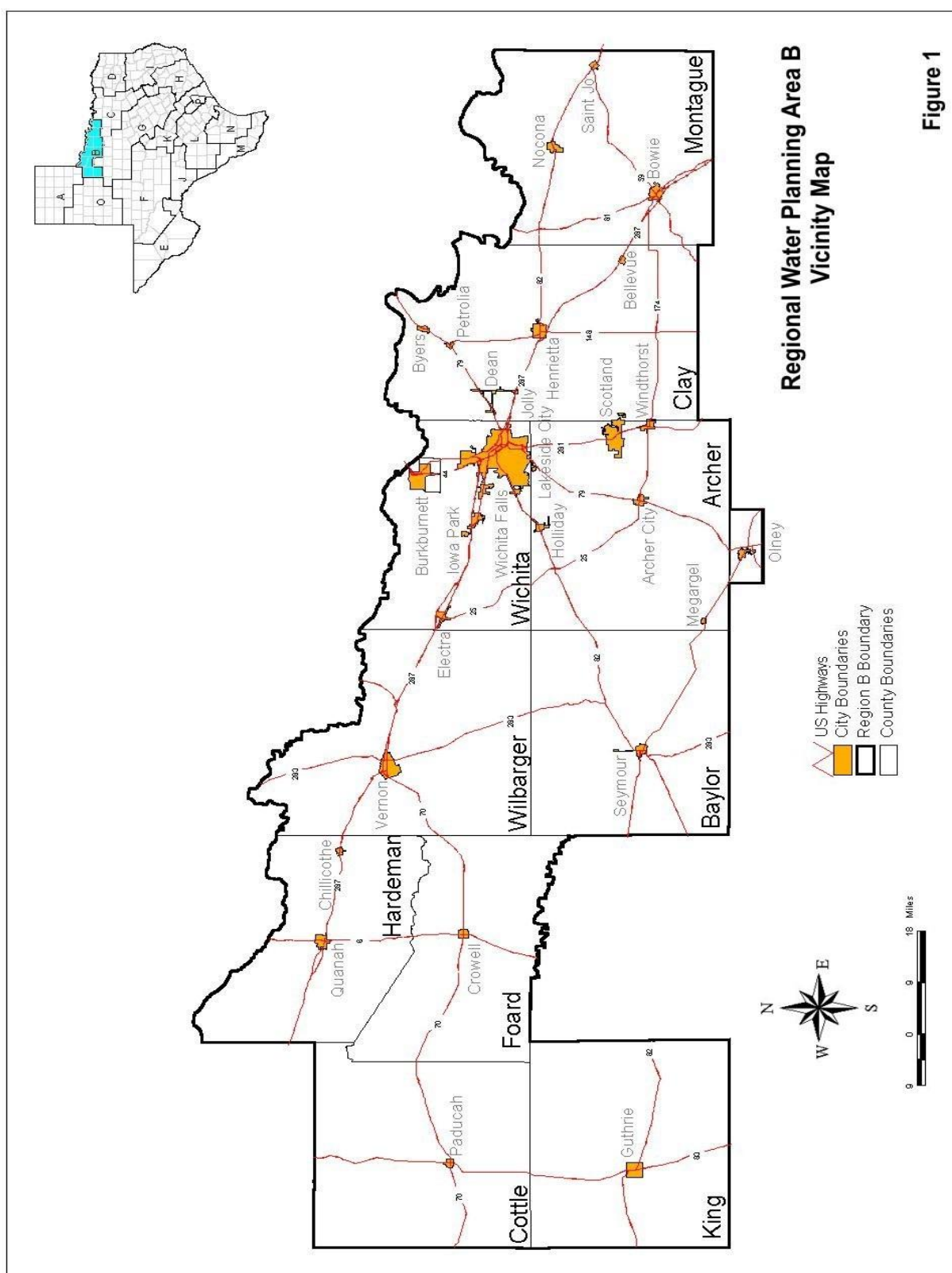


Table ES-1: County Populations

| County | Area (sq. mi) | 1990 Population | 2000 Population | % Change | Density people/sq.mi. |
|---------------|--------------------------|----------------------------|----------------------------|---------------------|----------------------------------|
| Archer | 910 | 7,973 | 8,854 | 11.0% | 10 |
| Baylor | 871 | 4,385 | 4,093 | -6.7% | 5 |
| Clay | 1,098 | 10,024 | 11,006 | 9.8% | 10 |
| Cottle | 901 | 2,247 | 1,904 | -15.3% | 2 |
| Foard | 707 | 1,794 | 1,622 | -9.6% | 2 |
| Hardeman | 695 | 5,283 | 4,724 | -10.6% | 7 |
| King | 912 | 354 | 356 | 0.6% | < 1 |
| Montague | 931 | 17,274 | 19,117 | 10.7% | 21 |
| Wichita | 628 | 122,378 | 131,664 | 7.6% | 210 |
| Wilbarger | 971 | 15,121 | 14,676 | -2.9% | 15 |
| Average | 862 | 18,683 | 19,802 | 6.0% | 23 |

The City of Wichita Falls is the largest demand center in the region. Other demand centers include Seymour, Henrietta, Quanah, Bowie, Nocona, Burkburnett, Electra, Iowa Park, Vernon, Olney, and Archer City. Table ES-2 below shows the population and water use of these demand centers.

Table ES-2: Regional Demand Centers

| County | City | 2000 Population | 2000 Municipal Water Use (Ac-Ft) |
|---------------|---------------|------------------------|---|
| Archer | Archer City | 1,848 | 321 |
| Baylor | Seymour | 2,908 | 692 |
| Clay | Henrietta | 3,264 | 732 |
| Hardeman | Quanah | 3,022 | 580 |
| Montague | Bowie | 5,219 | 1,063 |
| Montague | Nocona | 3,198 | 703 |
| Wichita | Burkburnett | 10,927 | 1,849 |
| Wichita | Electra | 3,168 | 598 |
| Wichita | Iowa Park | 6,431 | 1,250 |
| Wichita | Wichita Falls | 104,197 | 23,053 |
| Wilbarger | Vernon | 11,660 | 2,697 |
| Young | Olney | 3,396 | 737 |

While the population of Region B is only expected to reach near 221,734 by 2060, the Dallas-Fort Worth Metroplex, located just east of the region, is expected to top 9 million. This population could likely impose increasing pressures on water base recreational resources of the Region, as the number of people willing to travel into Region B for recreational purposes increases.

Population and Water Use Projections

The population projections for Region B were determined by the following:

- Using the latest information published by the State Data Center for city populations;
- Surveying the cities, smaller communities, rural water supply corporations, municipal utility districts, and river authorities to determine population based on existing meter counts;
- Using growth trends derived from the surveys based on populations and meter counts from 1990 to 2000.

Table ES-3 shows the population projections for each incorporated city by county and rural areas outside of any incorporated entity (Other Rural).

Table ES-3 – Population Projections

| CITY | COUNTY | RIVER | 1990 | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---------------|-----------|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | BASIN | POP. | POP. | POP. | POP. | POP. | POP. | POP. | POP. |
| Archer City | Archer | RED | 1,784 | 1,848 | 2,022 | 2,200 | 2,345 | 2,390 | 2,307 | 2,223 |
| Holliday | Archer | RED | 1,475 | 1,632 | 1,786 | 1,943 | 2,071 | 2,110 | 2,038 | 1,963 |
| Lakeside City | Archer | RED | 865 | 984 | 1,077 | 1,172 | 1,249 | 1,272 | 1,228 | 1,183 |
| Seymour | Baylor | BRAZOS | 3,185 | 2,908 | 2,692 | 2,569 | 2,378 | 2,206 | 2,089 | 1,933 |
| Byers | Clay | RED | 510 | 517 | 534 | 550 | 546 | 524 | 491 | 459 |
| Henrietta | Clay | RED | 2,896 | 3,264 | 3,374 | 3,470 | 3,448 | 3,306 | 3,103 | 2,900 |
| Petrolia | Clay | RED | 762 | 782 | 808 | 831 | 826 | 792 | 743 | 695 |
| Paducah | Cottle | RED | 1,788 | 1,498 | 1,458 | 1,455 | 1,384 | 1,304 | 1,233 | 1,193 |
| Crowell | Foard | RED | 1,230 | 1,141 | 1,137 | 1,145 | 1,121 | 1,081 | 1,055 | 1,017 |
| Chillicothe | Hardeman | RED | 816 | 798 | 796 | 795 | 791 | 786 | 780 | 769 |
| Quanah | Hardeman | RED | 3,413 | 3,022 | 2,981 | 2,954 | 2,863 | 2,746 | 2,617 | 2,371 |
| Guthrie | King | RED | 150 | 150 | 152 | 144 | 124 | 98 | 77 | 75 |
| Bowie | Montague | TRINITY | 4,990 | 5,219 | 5,305 | 5,389 | 5,423 | 5,436 | 5,440 | 5,449 |
| Montague | Montague | RED | 490 | 479 | 470 | 460 | 440 | 421 | 401 | 395 |
| Nocona | Montague | RED | 2,870 | 3,198 | 3,321 | 3,442 | 3,491 | 3,510 | 3,515 | 3,528 |
| Saint Jo | Montague | TRINITY | 1,048 | 898 | 898 | 898 | 898 | 898 | 898 | 898 |
| Burkburnett | Wichita | RED | 10,145 | 10,927 | 11,465 | 11,949 | 12,269 | 12,436 | 12,553 | 12,647 |
| Electra | Wichita | RED | 3,113 | 3,168 | 3,206 | 3,240 | 3,263 | 3,275 | 3,283 | 3,290 |
| Iowa Park | Wichita | RED | 6,072 | 6,431 | 6,678 | 6,900 | 7,047 | 7,124 | 7,178 | 7,221 |
| Wichita Falls | Wichita | RED | 96,259 | 104,197 | 109,663 | 114,576 | 117,825 | 119,525 | 120,710 | 121,668 |
| Vernon | Wilbarger | RED | 12,001 | 11,660 | 12,139 | 12,655 | 12,706 | 12,451 | 11,844 | 11,144 |
| Olney | Young | BRAZOS | 3,519 | 3,396 | 3,429 | 3,504 | 3,509 | 3,469 | 3,418 | 3,386 |
| Other Rural | | | 31,514 | 33,853 | 35,251 | 36,677 | 37,234 | 37,005 | 36,214 | 35,327 |
| Total | | | 190,895 | 201,970 | 210,642 | 218,918 | 223,251 | 224,165 | 223,215 | 221,734 |

The water use for Region B has been divided into several categories for analysis purposes. The various uses analyzed include water for municipal use (MUN), industrial or manufacturing

(MFG), power cooling (PWR), mining (MIN), agricultural irrigation (IRR), and livestock watering (STK). Table ES-4 shows the amounts of water predicted to be required for these categories through the year 2060. The water use is shown in acre-feet (Ac-Ft) units with one acre-foot being equivalent to 325,829 gallons of water.

Table ES-4 - Projected Water Use (Acre-Feet)

| | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| MFG | 3,266 | 3,547 | 3,755 | 3,968 | 4,260 | 4,524 | 4,524 |
| PWR | 9,460 | 13,360 | 17,360 | 21,360 | 21,360 | 21,360 | 21,360 |
| MIN | 1,176 | 909 | 845 | 811 | 785 | 792 | 792 |
| IRR | 102,121 | 99,895 | 97,702 | 95,537 | 93,400 | 91,292 | 91,292 |
| STK | 12,489 | 12,489 | 12,489 | 12,489 | 12,489 | 12,489 | 12,489 |
| MUN | 41,255 | 40,965 | 39,659 | 40,200 | 39,667 | 38,963 | 38,695 |
| TOTAL | 169,767 | 171,165 | 171,810 | 174,365 | 171,961 | 169,420 | 169,152 |

Total water consumption for the region is predicted to remain approximately level from 2000 to 2060.

Evaluation of Current Water Supplies

Water users in the Region B planning area receive surface water from sources in the Brazos, Trinity, and Red River Basins. In addition, groundwater is primarily supplied in Region B by two aquifers, the Seymour and the Blaine.

The Seymour is designated a major aquifer and is found in the central and western portions of the region. It is currently used in Hardeman, Wilbarger, Wichita, Clay, Baylor, Foard, and Cottle Counties. The Blaine is considered a minor aquifer and useable groundwater is limited to the westernmost portion of the region. These aquifers provide a large percentage of available supply in these counties. In addition, the upper portion of the Trinity Aquifer occurs in Montague County in the eastern part of the region. Limited quantities of groundwater are used from the Trinity for municipal and irrigation uses. There are also other formations within the region that are used for groundwater supply in limited areas. The TWDB identifies these sources as “Undifferentiated Other Aquifer”. These formations are not well defined in the literature, but

still provide substantial quantities of water in Archer, Clay, Cottle, Montague, and Wichita Counties.

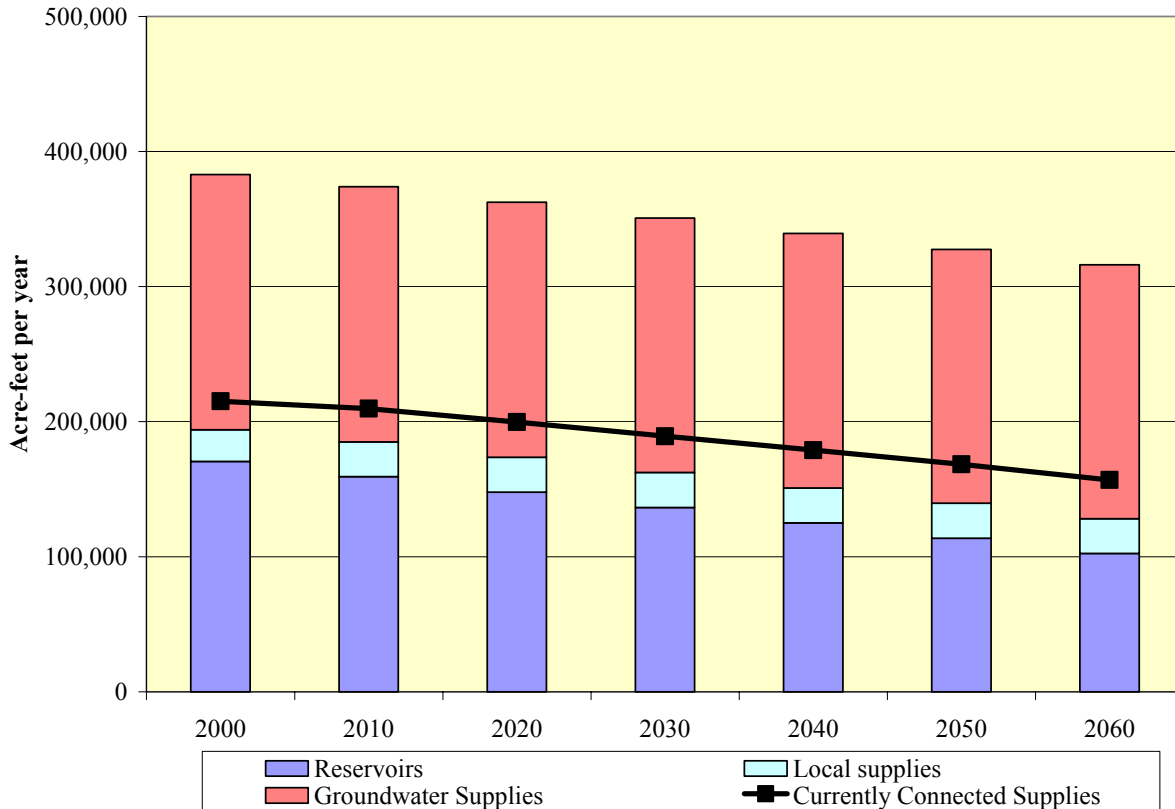
The total amount of supply currently available to Region B is approximately 383,000 acre-feet per year, as shown in Table ES-5. This represents firm supply available to the region. However, the supply that is available to each user is less due to operational and contractual constraints, infrastructure limitations, and water treatment capacities. A comparison of the regional firm supply to the current available supply for the water users is shown in Figure ES-1.

By 2060, the supply to Region B decreases by nearly 70,000 acre-feet per year. This is mostly the results of reduced storage capacities of existing reservoirs due to sediment accumulation. The Lake Kemp and Diversion system was found to have significant reductions in firm yield due to reduced storage capacity, and this system accounts for most of the regional supply reduction.

Table ES-5
Summary of Firm Supplies to Region B

| | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|-----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Reservoirs in Region B | 161,580 | 150,346 | 139,112 | 127,878 | 116,644 | 105,410 | 94,170 |
| Reservoirs outside Region B | 8,985 | 8,854 | 8,723 | 8,592 | 8,461 | 8,330 | 8,200 |
| Run-of-the-River Supplies | 14,666 | 14,666 | 14,666 | 14,666 | 14,666 | 14,666 | 14,666 |
| Local Supplies | 9,018 | 11,316 | 11,316 | 11,316 | 11,316 | 11,316 | 11,316 |
| Groundwater Supplies | 188,819 | 188,804 | 188,804 | 188,354 | 188,354 | 187,952 | 187,952 |
| Total | 383,068 | 373,986 | 362,621 | 350,806 | 339,441 | 327,674 | 316,304 |

Figure ES-1
Comparison of Firm Supplies to Supplies Available to Water Users



Identification, Evaluation and Selection of Water Management Strategies

A comparison of current supply to demand was performed using projected demands and the allocation of existing supplies developed as evaluated under drought of record conditions. Allocations of existing supplies were based on the most restrictive of current water rights, contracts, and available yields for surface water, historical use, and groundwater availability. The allocation process did not directly address water quality issues such as nitrates. Salinity was addressed to some extent by not assigning supplies with known high salinity levels for municipal use. This included most of the Blaine Aquifer.

As a region, there is adequate supply to meet the region's needs through 2040. A small shortage begins before 2050, and increases to nearly 13,000 acre-feet per year by 2060. A comparison of the total regional supply to demand is shown in Figure ES-2.

A summary of the projected needs by county are presented in Table ES-6. There are nine water user groups with identified shortages that cannot be met by existing infrastructure and supply. These shortages total 37,124 acre-feet per year by 2060. Of this amount, over 98 percent of the shortage is associated with reduced supplies in the Lake Kemp and Diversion system. Table ES-7 lists the water user groups with projected water shortages.

Figure ES-2 Supply and Demand for Region B

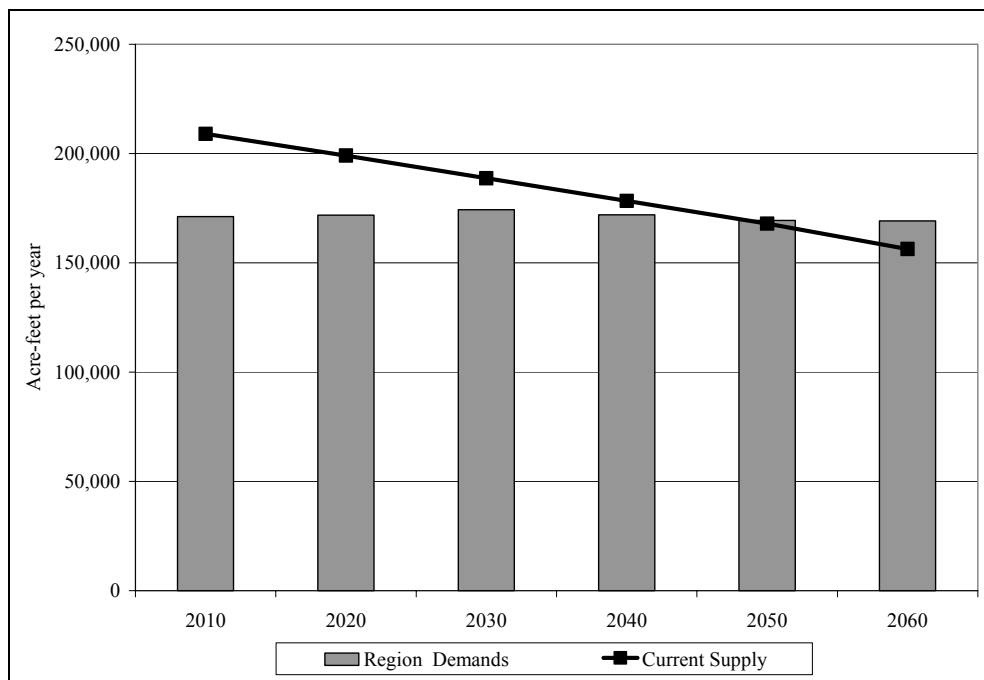


Table ES-6 Comparison of Supply and Demand by County

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---------------|---------------|---------------|---------------|--------------|-------------|----------------|
| Archer | 560 | 304 | -3 | -274 | -457 | -755 |
| Baylor | 1,905 | 2,011 | 2,115 | 2,187 | 2,238 | 2,284 |
| Clay | 684 | 635 | 591 | 640 | 789 | 779 |
| Cottle | 682 | 830 | 978 | 1,124 | 1,260 | 1,269 |
| Foard | 546 | 691 | 833 | 975 | 1,111 | 1,117 |
| Hardeman | 1,191 | 1,344 | 1,500 | 1,646 | 1,788 | 1,797 |
| King | 377 | 368 | 373 | 387 | 394 | 400 |
| Montague | 642 | 587 | 548 | 490 | 446 | 376 |
| Wichita | 15,030 | 9,570 | 2,250 | -4,243 | -10,744 | -19,577 |
| Wilbarger | 16,759 | 11,452 | 5,639 | 3,847 | 2,076 | -79 |
| Young (P) | 254 | 276 | 294 | 314 | 330 | 336 |
| Region | 38,631 | 28,068 | 15,119 | 7,094 | -769 | -12,053 |

Table ES-7 Projected Water Shortages for Water User Groups

| Water User Group | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|----------------------------------|-------------|---------------|----------------|----------------|----------------|----------------|
| County-Other - Archer | -162 | -126 | -161 | -187 | -142 | -136 |
| Irrigation - Archer | -9 | -276 | -539 | -795 | -1,046 | -1,370 |
| County-Other - Clay | -45 | -25 | -8 | 0 | 0 | 0 |
| Irrigation - Clay | -7 | -121 | -224 | -314 | -392 | -513 |
| County-Other - Montague | -133 | -184 | -197 | -206 | -194 | -197 |
| Mining - Montague | -113 | -92 | -86 | -93 | -108 | -111 |
| Electra - Wichita | -146 | -126 | -120 | -117 | -117 | -123 |
| Irrigation - Wichita | -259 | -4,674 | -9,106 | -13,556 | -18,025 | -23,577 |
| Steam Electric Power - Wilbarger | 0 | 0 | -4,132 | -6,453 | -8,774 | -11,097 |
| TOTAL | -874 | -5,624 | -14,574 | -21,721 | -28,799 | -37,124 |

While many water user groups were not identified with a shortage, several were found to have little to no supplies above the projected demands. The Region B Regional Water Planning Group recognized that these entities were likely to need to develop new supplies to provide a safe level of water supply. To determine which entities may be impacted, a safe supply was defined as being able to meet the projected demands plus 20 percent of the demand. This was applied only to municipal and manufacturing water user groups. Using these criteria, seven additional water users were identified with safe supply shortages as shown in Table ES-8.

Table ES-8 Water Users with Safe Supply Shortages

| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---------------------------|------|------|------|------|------|--------|
| County-Other - Archer | -269 | -223 | -265 | -296 | -242 | -235 |
| Lakeside City | -3 | 0 | -12 | -7 | 0 | 0 |
| Byers - Clay | -11 | -8 | -5 | 0 | 0 | 0 |
| County-Other - Clay | -223 | -199 | -179 | -79 | 0 | 0 |
| County-Other - Montague | -394 | -458 | -475 | -486 | -470 | -475 |
| Electra - Wichita | -261 | -236 | -228 | -223 | -222 | -228 |
| Iowa Park - Wichita | -110 | -96 | -103 | -114 | -124 | -142 |
| Wichita Falls - Wichita | 0 | 0 | 0 | 0 | 0 | -2,765 |
| Manufacturing - Wilbarger | -170 | -181 | -194 | -217 | -241 | -241 |
| Vernon - Wilbarger | -354 | -395 | -423 | -410 | -366 | -181 |
| Bowie - Montague | 0 | 0 | 0 | -31 | -73 | -134 |

The City of Wichita Falls is the only wholesale water provider in Region B and is a regional provider for much of the water in Wichita, Archer, and Clay counties. Considering current customer contracts and city demands, Wichita Falls has sufficient supplies to meet the projected firm needs and existing contractual obligations. The City has a projected shortage of 2,765 acre-feet per year to meet safe supply needs. In addition, several current and future customers have requested a total of 1,267 acre-feet per year. A summary of the supply and demand comparison for Wichita Falls is shown in Table ES-9.

Table ES-9 Projected Water Shortages for the City of Wichita Falls

| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|--|--------|--------|--------|--------|--------|--------|
| Total Demand | 31,925 | 30,990 | 31,879 | 31,919 | 31,947 | 32,111 |
| Total Supplies | 45,481 | 43,496 | 41,511 | 39,525 | 37,540 | 34,449 |
| Supplies Less Current Customer Demand | 13,556 | 12,506 | 9,632 | 7,607 | 5,594 | 2,338 |
| Required Safe Supply for Current Customers | 36,962 | 35,847 | 36,920 | 36,977 | 37,017 | 37,214 |
| Current Customer Safe Supply Surplus/ Shortage | 8,519 | 7,649 | 4,591 | 2,548 | 523 | -2,765 |

Water quality is a significant issue in Region B. Due to limited resources, some user groups are using water of impaired quality or having to install additional treatment systems to utilize existing sources. An implied assumption of the supply analysis is that the quality of existing water supplies is acceptable for the listed use. In other words, water supplies that are currently being used are assumed to continue to be available, regardless of the quality. Senate Bill 1 requires that water quality issues be considered when determining the availability of water

during the planning period. For this report, evaluations of source water quality are generally confined to waters used for human consumption. The effect of water quality of Lake Kemp on agricultural use is also reviewed.

The Texas Commission on Environmental Quality (TCEQ) identifies systems that are not compliant with current and proposed primary drinking water standards. This list was reviewed for water users in Region B. Compliance with secondary drinking water standards was not evaluated since the secondary standards do not have the same regulatory and public health implications. Also, compliance with the bacteriological standards (total coliform and fecal coliform) was not evaluated since violations of these standards, when they occur, are typically associated with operational techniques and not the quality of the raw water supply. The water systems in Region B that have existing or potential non-compliances are identified in Table ES-10, along with the parameter of concern.

Table ES-10
Water Systems Not Compliant with Primary Drinking Water Quality Standards

| Water System | County | Water Source | CURRENT STANDARD |
|----------------------------|-----------|-----------------|------------------|
| | | | NO ₃ |
| | | | MCL = 10 mg/L |
| Byers | Clay | Seymour Aquifer | X |
| Charlie WSC | Clay | Seymour Aquifer | X |
| Lockett Water System | Wilbarger | Seymour Aquifer | X |
| Hinds-Wildcat Water System | Wilbarger | Seymour Aquifer | X |

The TCEQ records indicate that the only primary drinking water standard (other than bacteriological) currently exceeded by water users in Region B is the nitrate criterion. Four water users have water supplies that exceed the MCL for nitrate.

In Region B, water supply needs were identified for three different categories: quantity, quality, and reliability. As shown on Table ES-11, a total of 19 water user groups were identified with one or more of these need categories. Nine water user groups were identified with firm quantity needs. An additional seven water user groups have projected safe supply shortages, and several municipal suppliers were found to have water quality and reliability issues.

Table ES-11
Water Users with Identified Needs

| User | County | Water Supply Needs | | |
|----------------------|-----------|--------------------|---------|-------------|
| | | Quantity | Quality | Reliability |
| County Other | Archer | X | | |
| Lakeside City | Archer | X | | |
| Irrigation | Archer | X | X | |
| County Other | Baylor | | | X |
| Seymour | Baylor | | | X |
| County Other | Clay | X | X | |
| Byers | Clay | X | X | |
| Irrigation | Clay | X | X | |
| County Other | Montague | X | | |
| Bowie | Montague | X | | |
| Mining | Montague | X | | |
| Electra | Wichita | X | | |
| Irrigation | Wichita | X | X | |
| Iowa Park | Wichita | X | | X |
| Wichita Falls | Wichita | X | | |
| County Other | Wilbarger | | X | |
| Manufacturing | Wilbarger | X | | |
| Steam Electric Power | Wilbarger | X | | |
| Vernon | Wilbarger | X | | |

For each of the identified needs, water supply strategies were developed based on discussions with the water user and the Regional Water Planning Group (RWPG) Technical Advisory Committee. In accordance with Senate Bill 1 guidance, the potentially feasible strategies were then evaluated with respect to:

- Quantity, reliability, and cost
- Environmental factors
- Impacts on water resources and other water management strategies
- Impacts on agriculture and natural resources
- Other relevant factors.

As required by Senate Bill 2, water conservation must be considered when developing water management strategies for water user groups with needs. Generally water conservation was not included in the projected demands for non-municipal water uses in Region B. An expected level of conservation is included in the municipal demand projections due to the natural replacement of inefficient plumbing fixtures with low flow fixtures, as mandated under the State Plumbing

Code. For Region B, the total municipal water savings associated with plumbing fixtures is approximately 14.3 percent of the projected demand if no conservation occurred.

Additional conservation savings can potentially be achieved in the region through the implementation of conservation best management practices. It is assumed that entities with low per capita water use will have minimal reductions in water use through conservation. In Region B there are ten municipal water user groups with identified safe supply shortages. Of these entities, Byers, Lakeside City, and Montague County-Other have per capita water use below the screening criteria of 140 gallons per person per day. Therefore, municipal conservation strategies will not be evaluated for these user groups.

Conservation strategies appropriate for Region B were evaluated based on the best management practices identified through the State Water Conservation Implementation Task Force. The Task Force identified 21 municipal conservation strategies and 15 strategies for industrial water users. In addition there are new federal regulations that require new clothes washers to be water efficient by 2007, which may reduce water use. After review and consideration of these strategies, the recommended municipal conservation package consists of four management practices:

- Public and School Education
- Reduction of Unaccounted for Water through Water Audits
- Water Conservation Pricing
- Passive Clothes Washer Rules

Best management practices not selected include rebate programs, accelerated plumbing fixtures replacements, and specific outdoor watering measures. The benefits of outdoor watering strategies were assumed to be accounted under the public and school education practice. Also, many of the entities in Region B already use restrictions on outdoor watering as a drought management measure. Accelerated fixture replacements do not reduce the ultimate water need, but could delay when the need begins. In Region B, the largest municipal water user, Wichita Falls, has water needs beginning in 2060. No additional savings can be achieved through accelerated implementation of plumbing fixtures. This is also true for rebate programs that

simply accelerate the already assumed conservation savings. The likelihood of implementing rebate programs in rural communities is low and previous studies have shown these programs to be relatively costly per acre-foot of water saved.

No industrial conservation strategies were evaluated because there is insufficient data to evaluate these strategies for the manufacturing safe needs in Wilbarger County. Where possible, reuse will be considered as a strategy for this need. For the irrigation and steam electric power needs associated with shortages in Lake Kemp, conservation through reductions in transmission losses in the irrigation canal system will be considered.

A summary of the water savings projected from conservation measures is shown in Table ES-12 and the savings expressed as a percentage of the projected water demands are shown in Table ES-13. Strategies that are required by federal (clothes washer rules) or state (water audits) regulations were assumed to be implemented in accordance with these regulations. Other conservation practices were assumed to be implemented in the decade the entity was found to have a water shortage.

Most of the savings shown in Table ES-12 are associated with the passive clothes washer rules that will require all new clothes washers to be energy efficient by 2007. This strategy assumes that every household that purchases a new clothes washer will reduce its water use by 5.6 gallons per person per day at no additional cost to the water provider; however, it is uncertain as to whether this amount of savings will be realized by the respective entity.

Table ES-12 Total Water Savings Associated with Conservation Strategies¹
(acre-feet per year)

| Water User Group | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Iowa Park | 21 | 57 | 68 | 72 | 76 | 80 |
| Electra | 10 | 28 | 33 | 34 | 36 | 38 |
| Vernon | 45 | 122 | 144 | 148 | 148 | 146 |
| Wichita Falls | 124 | 533 | 548 | 556 | 562 | 1,367 |
| Bowie | 8 | 34 | 34 | 61 | 69 | 72 |
| Byers ² | 0 | 0 | 0 | 0 | 0 | 0 |
| Lakeside City ² | 0 | 0 | 0 | 0 | 0 | 0 |
| Archer County-Other | 7 | 11 | 14 | 16 | 17 | 18 |
| Clay County-Other | 16 | 42 | 45 | 45 | 41 | 39 |
| Montague County-Other ² | 0 | 0 | 0 | 0 | 0 | 0 |

1. It is assumed that there are no savings directly from water audits. Savings are associated with system improvements as the result of water audits.
2. No conservation savings are estimated for Byers, Lakeside City, and Montague County-Other because the per capita water use is less than 140.

Table ES-13 Projected Water Savings as Percent of Municipal Demand

| Water User Group | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Iowa Park | 1.72% | 4.85% | 5.76% | 6.14% | 6.51% | 6.84% |
| Electra | 1.78% | 5.17% | 6.09% | 6.48% | 6.85% | 7.19% |
| Vernon | 1.67% | 4.60% | 5.48% | 5.86% | 6.21% | 6.56% |
| Wichita Falls | 0.54% | 2.42% | 2.40% | 2.45% | 2.48% | 5.98% |
| Bowie | 0.76% | 3.43% | 3.53% | 6.43% | 7.30% | 7.64% |
| Archer County-Other | 1.27% | 2.45% | 2.78% | 3.08% | 3.46% | 3.77% |
| Clay County-Other | 1.84% | 4.87% | 5.25% | 5.78% | 6.77% | 7.37% |

There are 14 municipal users in Region B that have been identified with water needs relating to quantity, quality, or reliability. These users include Archer County (Other), Baylor WSC, Clay County (Other), Montague County (Other), City of Bowie, City of Byers, City of Electra, City of Iowa Park, City of Lakeside City, City of Vernon, City of Wichita Falls, Charlie WSC, Hinds-Wildcat System, and Lockett Water System.

Based on a comparison of the total regional water supply to demand as shown in the previous Table ES-6, it was determined that there is adequate water supply to meet the needs of Region B as a whole up to the year of 2040. However, by the year 2050, the region is projected to have a

supply shortage of 769 acre-feet per year and by 2060 the shortage will increase to 12,053 acre-feet per year.

In addition, based on a comparison of the supply to demand of each water user group in Region B, the various water needs were identified and water management strategies were evaluated to meet each need. Though all the strategies may be viable options and should be considered by each affected entity, the following is a listing by county of the preferred water management strategies for each water user group with projected water supply needs.

Archer County

The maximum projected water need for Archer County is 1,678 acre-feet per year. Most of this need (1,370 acre-feet per year) is associated with the irrigation supply shortage from Lake Kemp.

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|---|---|------------------------------|----------------------------|-------------------------|
| Archer County (Other) | Municipal Conservation | 18 ¹ | \$1.72 | 2010 |
| | Purchase Water from Local Provider | 296 | \$5.26 | 2010 |
| Lakeside City | Purchase Water from Wichita Falls | 12 | \$1.25 | 2010 |
| Archer County Irrigation | Increase Water Conservation Elevation at Lake Kemp | 1,096 ¹ | \$0.01 | 2010 |
| | Seasonal Conservation Pool (April-Oct.) | 274 ¹ | \$0.01 | 2020 |
| TOTAL | | 1,696 | | |
| ALTERNATE STRATEGIES – NONE IDENTIFIED | | | | |

1. Supply varies by decade. The amount shown is the supply from this strategy in year 2060.

Baylor County

There are no projected water shortages in Baylor County of Region B, however, an emergency interconnect for Baylor WSC is recommended.

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|-----------------------------------|---|------------------------------|----------------------------|-------------------------|
| Baylor WSC and City of Seymour | Emergency Interconnect Millers Creek Reservoir | 250 | \$3.80 | 2010 |

Clay County

The maximum projected water need for Clay County is 747 acre-feet per year. Most of this need (513 acre-feet per year) is associated with the irrigation supply shortage from Lake Kemp.

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|---|---|----------------------|--------------------|---------------------|
| Clay County (Other) | Municipal Conservation | 39 ¹ | \$0.78 | 2010 |
| | Purchase Water from Local Provider | 223 | \$4.44 | 2010 |
| City of Byers | Purchase Water from Dean Dale WSC | 11 | \$2.29 | 2010 |
| Clay County Irrigation | Increase Water Conservation Elevation at Lake Kemp | 411 ¹ | \$0.01 | 2010 |
| | Seasonal Conservation Pool (April-Oct.) | 102 ¹ | \$0.01 | 2010 |
| Charlie WSC | Nitrate Removal Plant | 10 | \$6.90 | 2010 |
| TOTAL | | 796 | | |
| ALTERNATE STRATEGIES – NONE IDENTIFIED | | | | |

1. Supply varies by decade. The amount shown is the supply from this strategy in year 2060.

Cottle County

There are no projected water shortages in Cottle County of Region B.

Foard County

There are no projected water shortages in Foard County of Region B.

Hardeman County

There are no projected water shortages in Hardeman County of Region B.

King County

There are no projected water shortages in King County of Region B.

Montague County

The maximum projected water need for Montague County is 733 acre-feet per year. Most of this need (486 acre-feet per year) is associated with a safe need for Montague County (Other).

Montague County (continued)

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|-----------------------------|--|----------------------|--------------------|------------------|
| Montague County (Other) | Develop Additional Groundwater Supplies | 486 | \$1.54 | 2010 |
| City of Bowie | Municipal Conservation | 72 ¹ | \$0.71 | 2010 |
| | Wastewater Reuse | 134 | \$2.80 | 2040 |
| Montague County (Mining) | Purchase Water from Local Provider | 113 | \$4.52 | 2010 |
| TOTAL | | 805 | | |
| ALTERNATE STRATEGIES | | | | |
| Montague County (Other) | Purchase Water from Local Provider | 486 | \$3.75 | 2010 |
| City of Bowie | Develop Additional Groundwater Supply | 134 | \$3.73 | 2040 |
| Montague County (Mining) | Develop Additional Groundwater Supply | 113 | \$1.54 | 2010 |

1. Supply varies by decade. The amount shown is the supply from this strategy in year 2060.

Wichita County

The maximum projected water need for Wichita County is 26,745 acre-feet per year. Most of this need (23,577 acre-feet per year) is associated with the irrigation supply shortage from Lake Kemp.

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|------------------------------|---|----------------------|--------------------|------------------|
| City of Electra | Municipal Conservation | 38 ¹ | \$1.24 | 2010 |
| | Purchase Water from Wichita Falls | 1,680 | \$2.48 | 2010 |
| City of Iowa Park | Municipal Conservation | 80 ¹ | \$0.83 | 2010 |
| | Purchase Water from Wichita Falls | 1,680 | \$1.65 | 2010 |
| City of Wichita Falls | Municipal Conservation | 1,367 ¹ | \$0.24 | 2010 |
| | Wastewater Reuse | 11,000 | \$1.76 | 2020 |
| Wichita County Irrigation | Increase Water Conservation Elevation at Lake Kemp | 10,000 ¹ | \$0.01 | 2010 |
| | Seasonal Conservation Pool (April-Oct.) | 5,000 ¹ | \$0.01 | 2010 |
| | Enclose Canal Laterals in Pipe | 8,577 | \$1.20 | 2040 |
| TOTAL | | 39,422 | | |
| ALTERNATE STRATEGIES | | | | |
| City of Wichita Falls | Construct Lake Ringgold | 27,000 | \$3.30 | 2060 |

1. Supply varies by decade. The amount shown is the supply from this strategy in year 2060.

Wilbarger County

The maximum projected water need for Wilbarger County is 11,761 acre-feet per year. Most of this need (11,097 acre-feet per year) is associated with the steam-electric power supply shortage from Lake Kemp.

| Water User | Strategy Description | Supply (ac-ft/yr) | Cost/ 1,000 gal | Implement Decade |
|---------------------------------------|--|----------------------|--------------------|------------------|
| City of Vernon | Municipal Conservation | 146 ¹ | \$0.45 | 2010 |
| | Develop Additional Groundwater Supply | 600 | \$1.04 | 2010 |
| Lockett Water System | Purchase Water from City of Vernon | 109 | \$5.68 | 2010 |
| Hinds-Wildcat Water System | Nitrate Removal Plant | 40 | \$3.76 | 2010 |
| Wilbarger County Steam Electric Power | Increase Water Conservation Elevation at Lake Kemp | 4,193 ¹ | \$0.01 | 2010 |
| | Seasonal Conservation Pool (April–Oct.) | 874 ¹ | \$0.01 | 2010 |
| | Enclose Canal Laterals in Pipe | 6,023 | \$1.20 | 2040 |
| Wilbarger County Manufacturing | Purchase Water from City of Vernon | 241 | \$2.35 | 2010 |
| TOTAL | | 12,049 | | |
| ALTERNATE STRATEGIES | | | | |
| Lockett Water System | Nitrate Removal Plant | 109 | 1.38 | 2010 |
| Hinds-Wildcat Water System | Purchase Water from City of Vernon | 40 | 7.21 | 2010 |

1. Supply varies by decade. The amount shown is the supply from this strategy in year 2060.

Young County

There are no projected water shortages in Young County of Region B.

Impacts of Selected Water Management Strategies on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas

The Region B Water Planning Group is proposing five preferred water management strategies. Each of the strategies were evaluated and it was determined that none of the proposed strategies are likely to have adverse impacts on water quality within the region. In addition, though some additional agricultural lands may be utilized to develop needed groundwater supplies, the impact on agricultural lands will be minimal.

Consolidated Water Conservation and Drought Management Recommendations

Water conservation is a potentially feasible water savings strategy that can be used to preserve the supplies of existing water resources. Some of the demand projections developed for Senate Bill 1 planning incorporate an expected level of conservation to be implemented over the planning period. For municipal use, the assumed reductions in per capita water use are the result of the implementation of the State Water-Efficiency Plumbing Act. On a regional basis, this is about a 14.3 percent reduction in municipal water use by year 2060 (from a regional per capita use of 182 gallons per person per day to 156 gallons per person per day). Additional municipal water savings may be expected as the federal mandate for energy efficient clothes washing machines takes effect in 2007.

Water conservation and drought management are often a way of life in Region B. With frequent periods of drought, water providers recognize the importance of active management and conservation of local water resources. The Region B Water Planning Group also recognizes that advanced water conservation measures (i.e. savings associated with active conservation measures for municipal and industrial uses) will be implemented by local governing entities or water users as conditions arise. The recommended strategies presented in this plan provide a framework from which water providers can use to develop plans and/or strategies to meet their needs. Region B Planning Group supports the use and consideration of any water conservation strategy deemed appropriate by a water user.

Acknowledging the importance of water conservation to meet future water needs in Region B, this water plan recommends several water conservation strategies for users with identified needs:

- Municipal conservation
- Municipal reuse
- Irrigation conveyance loss reduction

The amount of conservation from each of these strategies is shown in Table ES-14, and represents approximately 54 percent of the total supply from all recommended strategies by 2060.

Table ES-14: Conservation by Strategy

| Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|-----------------------------------|--------|--------|--------|--------|--------|--------|
| Additional Municipal Conservation | 230 | 829 | 886 | 932 | 948 | 1,760 |
| Wichita Falls Reuse | | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Bowie Reuse | | | | 134 | 134 | 134 |
| Lake Kemp Canal Project | | | | 14,600 | 14,600 | 14,600 |
| Total Conservation | 230 | 11,829 | 11,886 | 26,666 | 26,682 | 27,494 |
| | | | | | | |
| Total – New Supplies ¹ | 27,007 | 25,653 | 23,710 | 36,484 | 51,483 | 50,530 |
| % Conservation | 1% | 46% | 50% | 73% | 52% | 54% |

1. New supplies include conservation savings.

Description of How the Regional Water Plan is Consistent with Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

The development of viable strategies to meet the demand for water is the primary focus of regional water planning. However, another important goal of water planning is the long-term protection of resources that contribute to water availability, and to the quality of life in the state.

To be consistent with the long-term protection of water resources the plan must recommend strategies that minimize threats to the region's sources of water over the planning period. The water management strategies were evaluated for threats to water resources. The recommended strategies represent a comprehensive plan for meeting the needs of the region while effectively minimizing threats to water resources.

Agriculture is an important economic cornerstone of Region B. Given the relatively low rainfall, irrigation is a critical aspect of agriculture in the region. The source of most of the region's irrigation is the Lake Kemp/Lake Diversion system, which provides water via a canal system located in Archer, Wichita, and Clay Counties.

Protection of the Lake Kemp/Lake Diversion system has been a central focus of the water planning process for Region B.

Region B contains many natural resources that must be considered in water planning. Natural resources include threatened or endangered species; local, state, and federal parks and public land; and energy/mineral reserves. The Region B Water Plan is consistent with the long-term protection of these resources.

Recommendations Including Unique Ecological Stream Segments, Reservoir Sites, Legislative and Regional Policy Issues

In accordance with 31 TAC 357.7 (a)(9), 31 TAC 357.8, and 31 TAC 357.9, the following recommendations are proposed to facilitate the orderly development, management, and conservation of the water resources available within Region B:

- It is recommended that the Chloride Control Project on the Wichita River and the Pease River be made a regional priority in order to enhance the water quality of Lake Kemp and Lake Diversion, and reclaim those lakes as a viable cost effective short term and long term regional water supply source.
- Based on the results of the Lake Kemp and Lake Arrowhead brush management studies, it is recommended that the state consider providing adequate funding to implement brush management and other land stewardship programs in an attempt to increase watershed yields.
- Region B recommends that no segments be designated as "Unique Stream/River Segments" or "Unique Reservoir Sites" at this time. Pending the results of comprehensive studies and clarification of the significance and impacts of designation, the Regional Water Planning Group may consider designations within the region in the future.
- It is recommended that Region B encourage the regulatory agencies to consider allowing continued long-term use of bottled water programs, and/or providing a waiver for small user groups that can demonstrate they have no reasonable cost-effective means to comply with the current MCL of 10 mg/l.

- It is recommended that Region B support and seek adequate state funding to develop, implement, and evaluate the necessary management strategies adopted as part of this regional plan. This includes strategies identified to meet a specific need as well as general strategies to increase water supply in the region.
- It is recommended that Region B support the grass-roots regional water planning process enacted by SB1 and strongly encourages the process be continued with adequate state funding for all planning efforts including administrative activities and data collection.
- It is recommended that Region B support state funding for agricultural water use data collection and agricultural water use management/conservation projects.
- Senate Bill 1 requires future projects to be consistent with the approved regional water plan to be eligible for TWDB funding and TCEQ permitting. It is recommended that surface water uses that will not have a significant impact on the region's water supply and water supply projects that do not involve the development of or connection to a new water source should be deemed consistent with the regional water plan even though not specifically recommended in the plan.
- The Region B Planning Group recommends that the state support both federal and state efforts to rehabilitate existing sediment control structures and encourage funding and support for the construction of new structures in watersheds that would have the greatest benefits.
- With regards to conservation it is recommended that the Legislature allow each region to establish realistic, appropriate, and voluntary water conservation goals as opposed to being forced to comply with a state mandated requirement.
- Region B recommends that the gallons per capita per day (gpcd) calculation of water use be based on residential water use only.